

most power, battery **88** and solar panel **92** are sized to provide sufficient power for the required data transmission frequency. The battery **88** may be a lead-acid, nickel-cadmium, nickel metal hydride or any other battery that may be charged by solar panel **92** or AC power **86**. The circuitry for a remote monitoring unit will normally be in the sleep mode or off mode and will only switch on when measurements are taken (typically once per day) thus preserving power and allowing battery **88** to be recharged. Alternatively, the remote monitoring unit may be kept in a standby mode allowing communications at any time, provided sufficient recharging of battery **88** occurs through solar panel **92**.

[0085] As discussed above, remote monitoring units are prone to damage by electrical surges, which are the most common cause for failure. Surges may enter the unit through the AC supply, through the hardware connections to the pipeline **10** or rectifier **24** or through connections to other sensing devices **70** to **80**. Electronic surge protection devices (e.g. MOV, spark gap etc.) are currently used but are not totally effective, and either do not block all the surges or eventually fail. Because lightening causes kilovolt surges in a pipeline, a simple relay may allow the electricity to arc across the contacts of the relay. Thus, there must be a large dielectric strength between contact points. This can be achieved by placing a substantial distance between the two contact points. Statistically, the chance of a lightening strike during the period of operation of the present invention unit is very remote. Disconnect assembly **94** in **FIG. 7** provides the required dielectric strength between contact points.

[0086] Disconnect assembly **94**, shown in detail in **FIG. 8**, is a preferred embodiment of the present invention. In this embodiment, disconnect assembly **94** includes a stationary base **96** and a moving connecting block **98**. Support guides **100** are connected to base **96** and connecting block **98** slides over support guides **100** toward and away from base **96**. Base **96** is preferably fitted with contact points **102a** and connecting block **98** is preferably fitted with contact points **102b**. Contact points **102a,b** may be spring loaded and may be plated with an inert metal to prevent oxidation. Insolated electrical conductors **104** are connected to contact points **102a,b** and provide a means for electrical connection. Connecting block **98** is moved into an open or closed position with a motor drive assembly **106**, which turns a threaded shaft **108**. Threaded shaft **108** preferably screws through connecting block **98** and moves freely in base **96**. Therefore, when motor drive assembly **106** rotates in one direction, connecting block **98** moves towards base **96** into the closed position, and when the motor drive assembly **106** rotates in the other direction, connecting block **98** moves away from base **96** into the open position. Motor drive assembly **106** may comprise any motor configuration, such as a DC motor with a gear drive capable of rotating threaded shaft **108** in either direction to provide an air gap between the contact points when connecting block **98** and base **96** are in the open position. One preferred air gap is at least 1 inch and preferably 2 inches. In addition, disconnect assembly **94** may include limiting switches (not shown), which determine the open and closed position for connecting block **98**. This design therefore allows for controlling the distance that connecting block **98** moves away from base **96** in the open position.

[0087] Disconnect assembly **94** may optionally include a control circuit **110**, allowing control and monitoring of disconnect assembly **94** using digital input and output capabilities of measurement and control unit **84** or communication module **64**. In some embodiments, measurement and control unit **84** or communication module **64** include a timer that activates the disconnect assembly **94** at a predetermined frequency (e.g. once a day) to perform measurements and tests. The disconnect assembly **94** is moved to the closed position for taking a measurement or test and then moved to the open position after the measurement or test has been taken. Furthermore, control circuit **110** may include a microprocessor (not shown) with on-board clock allowing programming of disconnect assembly **94**. Control circuit **110** with the microprocessor makes it possible to program disconnect assembly **94** to open and close at pre-set times without the need for other external control signals. In addition, control circuit **110** with the microprocessor can provide feedback on the status of disconnect assembly **94** such as confirmation that disconnect assembly **94** is in the open or closed position.

[0088] In one embodiment, the disconnect assembly **94** is a multiple contact device; four contacts are shown in **FIG. 8**. Disconnect assembly **94** is not limited to 4 contacts and more or less than 4 contacts may be required in certain measurement configurations.

[0089] Since disconnect assembly **94** is only connected a few seconds or minutes a day, it is therefore disconnected most of the time. As a result, there is no need for an electrical storm detector. Secondly, the substantial separation distance between contact points **102a** and contact points **102b** eliminates the need for a dielectric between the contact points **102a** and **102b**. Thus, there is a predetermined air gap in the open position such that arcing across the gap cannot occur.

[0090] An advantage of the present invention is that the circuits in the remote monitoring unit do not have to be in the on or active state at all times, but only need to switch on when a measurement is to be carried out. It is therefore possible to isolate all inputs to the circuits during times when no measurements are carried out and only to switch the circuits on for the few minutes per day when measurements are carried out and data transmitted. The remote monitoring unit need only be on for seconds/minutes a day rather than 24 hours a day as in the prior art. All measurements can be acquired within seconds/minutes, typically less than 5 minutes. Thus, there is no reason to keep hard wire connections between the remote monitoring unit and pipeline **10** and between the remote monitoring unit and sensors **70** to **80** throughout the day. Referring back to **FIG. 7**, other circuits such as the AC or DC power supply or an antenna **89** of a communications system **138** may also be disconnected if required. There is no need for a permanent connection. In a preferred embodiment, all circuits are disconnected at all times when measurements are not being taken.

[0091] It should be appreciated that while the present invention has been described using disconnect assembly **94**, other disconnect assemblies may be used, provided the disconnect assembly is in the off state most of the time. Such other disconnect assemblies may be alternative designs where an air gap is created of at least 1 to 2 inches between contact points, or it may also be some other form of switch, e.g. a relay. Provided the disconnect assembly is in the off